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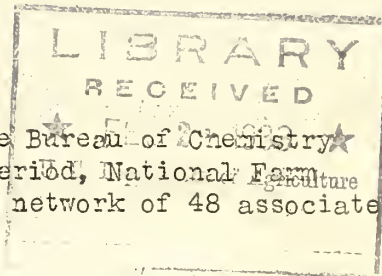
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PRODUCTS FROM FARM BY-PRODUCTS.

A radio talk by Dr. Henry G. Knight, Chief of the Bureau of Chemistry and Soils, delivered in the Department of Agriculture period, National Farm and Home Hour, Friday, January 20, 1933, broadcast by a network of 48 associate NBC radio stations.



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SALISBURY:

I'm happy and also a little bit sorry to present to you today Dr. Henry G. Knight, the Chief of the Bureau of Chemistry and Soils. He has given us a series of 16 reports on the recent results of research work by the chemists and soil scientists of the Department. Today he brings this series to a close with the 17th report. This report will be on the results of research by chemists and others into the possibility of finding by-product uses for farm crops. Ladies and gentlemen, Dr. Knight.

KNIGHT:

Thank you, Salisbury. Let me say to you and to the Farm and Home Hour audience that I have enjoyed giving you these reports on the results of our research. I'll return to the Farm and Home microphone later this year, I hope, to give you some more reports on progress of our scientific work.

Now today, I ask you to turn your attention to one part of the problem of cutting farm production costs -- or rather, of raising farm income -- that we haven't talked much about in the other reports I've given you. I don't need to go into any lengthy discussion of the economic intricacies of the situation in order to get you to agree that the more use we make of the crop plants that grow in our fields each year, the better our income will be.

Now I have told you, in some of my brief reports, about our success in finding new uses for apples and citrus fruits and cotton and sweet potatoes. But I have not discussed with you the systematic search that one group of our chemists is making to find industrial uses for such things as stalks and hulls and straw -- parts of crop plants which we sometimes think of as wasted. Farmers grow enormous quantities of these things. For every hundred pounds of grain we also produce anywhere from 100 to 250 pounds of straw or stalks and hulls. Altogether, this country each year turns out somewhere in the neighborhood of 260 million tons of such materials.

Now of course farmers can, you might say, "sell" this material to themselves. That is, they can use it for feed, bedding, and fertilizer. In the final analysis, all three uses amount to the same thing -- soil fertility, our chief ally in maximum crop production. But the fact remains that huge tonnages of straw and stalks and hulls annually go to waste. For some time our chemists have been trying to find possible outlets for these crop wastes as raw materials for industrial processes. I'm sure you all know that this research has developed the process of making pulp board from sugar cane bagasse. And you've all read about the success of experiments in making news print paper and rayon fiber and cellulose varnishes from different kinds of crop residues, such as corn stalks. Recently we have found that a good grade of white paper can be made from sugar cane bagasse, straw, and corn stalks. Also that bagasse can be used in the

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manufacture of a high grade of the chemical product called alpha cellulose and used in the textile industry.

In short, our chemists have found more than half a dozen uses in the so-called cellulose industries for stalks and straw from various crops.

But, you very properly say to me, the proof of the pudding is in the eating. If all this has been done by the chemists, why can't I sell my straw or my bagasse to a paper mill or a rayon plant? Now that is a fair question to ask of me. Here's my answer, as briefly as I can put it:

The chemists have solved the scientific problem of using stalks and straw in the cellulose industries. But a business problem remains. That is the problem of relative costs -- costs of corn stalks and wheat straw as raw material for paper, compared with costs of wood and rags; also costs of making corn stalks and wheat straw into paper as compared with the costs of making wood and rags into paper. In the final analysis the use of stalks and straw in the cellulose industries depends on whether the farmer can afford to sell them at a price that will compete with the other raw materials that may be used in these industries, or whether he will make more by keeping the stalks and straw on the farm and returning them to the soil to keep up its fertility.

Well, so much for the possibilities of using farm wastes in the cellulose industries. Now we are carrying on a variety of experiments to find other possible industrial uses of stalks, straw and hulls. We believe that most of these other uses will be based on the lignin content of these plant materials. This lignin occurs in vast quantities in plant materials. Our chemists are unlocking many of the secrets of lignin as a chemical compound. We have made dyes from lignin that are better than the first coal-tar dyes that were made 50 years ago. We have produced an artificial resin from lignin. We have produced many other chemical compounds used in various industries and now derived from other sources. In fact, I think it is safe to say that lignin bids fair to become as valuable to chemists as coal-tar itself is today. Coal-tar, you know, was at one time considered a waste product of gas works and coke ovens. Now it is the basis for a whole series of chemical industries -- dye manufacture, synthetic drug manufacture, and so on.

Besides experimenting with the possibilities of the lignin content of crop plants, we have distilled stalks and straw and produced a gas that can be compressed in cylinders and used for fuel and lighting, together with tar which might be used as a binder for making up little briquettes of chaff and hulls and chopped or pulverized stalks or straw. Of course, these briquettes would find use as fuel. We have not succeeded in bringing this process to a point where an average farm could produce its own fuel and light out of crop residue, but it is entirely possible that a community might do so.

We have extended the idea of producing heating and illuminating gas from stalks and straw to experiments in which the energy to break down plant tissues and turn them into gas and chemical by-products is furnished by micro-organisms. An experimental plant working on this principle and producing heating and lighting gas by fermentation of farm wastes mixed with sewage is in operation at Ames, Iowa.

Now I want to answer a question that is often asked of us. This question is: How about manufacturing industrial alcohol from surplus and waste fruits and vegetables?



Now here's the answer: First, ethyl or "grain" alcohol may be derived either from sugary or starchy plant material. But to manufacture it from starchy plant materials you first have to turn the starch content of the plant into sugar. Therefore, the sugary plant materials have the advantage. And in this country cane molasses has proved to be the cheapest source of industrial alcohol because it contains a high percentage of fermentable sugar, and it can be obtained in large quantities at a low price, since it is a by-product of the manufacture of sugar.

We have carried on a long series of experiments and we have carefully analyzed the situation. We have tried to find out whether waste fruits and vegetables might displace or supplement cane molasses as the basic raw material for the manufacture of industrial alcohol. Here's our conclusion. At present there would be no profit in using farm wastes for this purpose. I see my time is about to expire, and I will not be able to go with you into the rather involved economic situation that led us to this conclusion. But if any of you want a full and complete explanation, write to me and I'll see that you get it.

Now just let me sum up the results of our experiments with and experience in developing by-product uses for the things we ordinarily think of as farm wastes -- straw and hulls and stalks. I pointed out that there are two different ways of making use of this material. The first way is to use it on the farm for feed and bedding and fertilizer -- in other words, to use it in building up soil fertility, the most important asset of any farm.

The second way in which these so-called "wastes" of the farm might be used is by processing them into manufactured articles. And I outlined the progress of research to find such outlet. I told you that the scientific problem of using these farm wastes in the cellulose industries -- that is, for the production of paper and rayon and so forth -- the scientific problem has been solved. The problem of whether or not it will be good business still remains. I told you of the progress toward solution of the problem of making the lignin in plants useful in a wide variety of industries; also of the problem of turning stalks and straw into fuel either by a process of distillation or by a process of fermentation. And finally I told you that after an exhaustive series of experiments we have come to the conclusion that cull fruits and vegetables cannot profitably be used as raw materials for industrial alcohol, and offered to provide any of you interested in this point with further information if you desire it.

Now may I just say briefly again that I enjoyed giving these reports to you on the results of our research work. If any of you Farm and Home Hour listeners at any time wish information on the results of or the present progress of the research by chemists and soil scientists, please feel free to write me. Our people will send you the information in just as practical and useable form as it can be got up.

Thanks for your kind attention and your encouraging comments, and goodbye until I come on the air to give you another series of reports.

SALISBURY:

Well, Dr. Knight, speaking on behalf of Farm and Home Hour listeners, I give you our thanks for your very interesting and practical series of reports. We look forward to having you with us again in these programs.

